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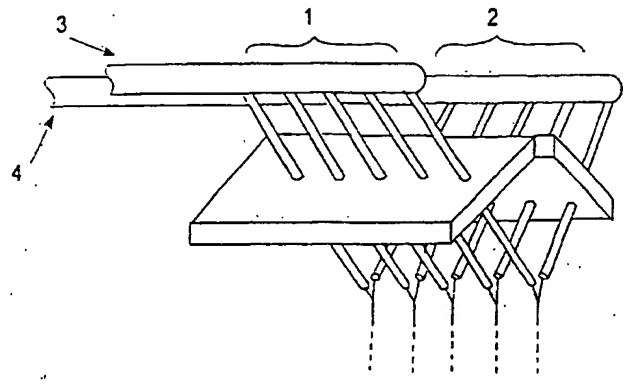
(54) WATER ABSORBING COMPOSITE, METHOD FOR PREPARATION THEREOF AND WATER ABSORBING ARTICLE

(57) Disclosed is a water-absorbing composite comprising water-absorbing polymer particles immobilized on a fibrous substrate wherein at least a part of said water-absorbing polymer particles consist of primary particles having an average particle diameter of 50-1000 μm, 30% by weight or more of said primary particles are combined to form agglomerates having a shape satisfying the conditions below while nearly maintaining their primary particle shapes and a part of particles of said agglomerates are not adhered to said fibrous substrate. This water-absorbing composite shows excellent water-absorbing properties and a high water-absorbing speed, and most of the highly water-absorbing polymer is stably immobilized on the fibrous substrate and the immobility of swollen gel after absorbing water is also excellent.

Average particle diameter (D) $100 \leq D \leq 3000$ μm
Average relative displacement of the direction by direction analysis (θ) $10 \leq \theta \leq 25$
Frequency analysis 5 Hz/20 Hz intensity ratio (k) $0.6 \leq k \leq 0.9$
Agglomerate maximum length (L) / minimum length (1) ratio $1.2 \leq L/1 \leq 15.0$.

FIG.1



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[0110] When comparing the results of samples 1 and 2, the diaper of sample 1 having a water-absorbing face on the water-absorbing resin particle side shows much lower water-absorbing speeds in the second and third tests as compared with the diaper of sample 2 having a water-absorbing face on the fibrous substrate side according to the present invention. Among diapers of the present invention, sample 3 having a fluffy pulp layer on the water-absorbing resin particle side is superior to sample 4 having a fluffy pulp layer on the fibrous substrate side in both absorbing speed and released amount. Sample 5 is a conventional diaper, which shows lower water-absorbing speeds in the second and third tests.

[0111] The diapers of sample 2 and sample 5 prepared as above were tested for the transfer amount of water-absorbing resin particles in the diapers when a force rubbing the diapers was repeatedly applied. Each diaper of 180 x 180 mm having absorbed water in an amount 50 times the weight of the water-absorbing resin was mounted on a shaking table, and an acrylic plate of 120 x 120 mm curved in a semicircle was further mounted thereon so that the outer center of the semicircle coincides with the center of the diaper. The inner center of the semicircle has an insertion part, in which the post of a T-shaped weight (3 kg) was loosely inserted while it was supported at the center of a plate of 100 x 100 mm. When the shaking table oscillates, the weight swings around the post so that the acrylic plate reciprocates to rub the diaper. After the shaking table was oscillated for 5 minutes at 80 reciprocations/min, the center of the diaper was cut out into a size of 100 x 100 mm to determine the reduction percentage of water-absorbing resin particles. The results showed that the reduction percentage of the water-absorbing resin of the diaper of sample 2 was 15% in contrast to the diaper of sample 5 in which the reduction was 29%, i.e. almost doubled.

INDUSTRIAL APPLICABILITY

[0112] In water-absorbing composites of the present invention, most of the highly water-absorbing polymer form proper agglomerates stably immobilized on a fibrous substrate. They show excellent water-absorbing properties, a high water-absorbing speed and an excellent immobility of swollen gel after absorbing water. According to processes of the present invention, water-absorbing composites showing such excellent performance can be simply and economically prepared with little residual monomers. Therefore, water-absorbing articles using a water-absorbing composite of the present invention or a water-absorbing composite prepared by a process of the present invention are of very high practical value and utility.

Claims

1. A water-absorbing composite comprising water-absorbing polymer particles immobilized on a fibrous substrate wherein at least a part of said water-absorbing polymer particles consist of primary particles having an average particle diameter of 50-1000 μm, 30% by weight or more of said primary particles are combined to form agglomerates having a shape satisfying the conditions below while nearly maintaining their primary particle shapes and a part of particles of said agglomerates are not adhered to said fibrous substrate:

   Average particle diameter (D) $100 \leq D \leq 3000$ μm
   Average relative displacement of the direction by direction analysis (θ) $10 \leq \theta \leq 25$
   Frequency analysis 5 Hz/20 Hz intensity ratio (k) $0.6 \leq k \leq 0.9$
   Agglomerate maximum length (L) / minimum length (1) ratio $1.2 \leq L/1 \leq 15.0$.

2. The water-absorbing composite of claim 1 wherein 50% by weight or more of said water-absorbing polymer particles form said agglomerates.

3. The water-absorbing composite of claim 1 wherein 80% by weight or more of said water-absorbing polymer particles form said agglomerates.

4. The water-absorbing composite of any one of claims 1-3 wherein said fibrous substrate comprises one or more selected from synthetic fibers, natural fibers, semisynthetic fibers and inorganic fibers.

5. The water-absorbing composite of any one of claims 1-4 wherein said agglomerates are formed by polymerizing an aqueous ethylenically unsaturated monomer solution with a redox polymerization initiator.

6. The water-absorbing composite of any one of claims 1-5 obtained by forming droplets of a reaction mixture initialized by mixing an aqueous solution of a polymerizable monomer giving a water-absorbing polymer with a redox polymerization initiator in a gas phase, combining said droplets into agglomerates while nearly - maintaining their